## case

THE NC ignores THE STRUCTURES UNDERGIRDING private entity’s MANUFACTURED PRODUCTIVITY -- THE SPACE INDUSTRIAL COMPLEX IS A SUPERSTRUCTURE controls THEIR PERCEPTIONS OF AND JUSTIFICATIONS FOR THE ULTRA RICH - the NC is weak JUSTIFICATION FOR THE EXPLOITATION OF THE TRILLIONS OF FUTURE LIVES THEY CLAIM TO BE “SAVING”. THE SPACE INDUSTRIAL COMPLEX HAS TAKEN OVER nova AND THEIR CASE THE ONLY WAY TO ACADEMICALLY DIVORCE OURSELVES FROM CAPITALISM IS TO VOTE AFFIRMATIVE

## Asteroid mining DA

### Generic Block

#### 1. “Corporate innovation” is a sham—XT Savage 21. Most tech used by private companies in space was developed through public efforts. Empirics prove—GPS, touchscreens, and computers were all invented by govt.

#### 2. The DA links back to the K—XT Penny 20. Asteroid mining represents the enclosure of the public commons for the wealthy instead of humanity as a whole.

#### Their tech optimism is misplaced- everything needs redesign for space

RIEDERER 14

(RACHEL, Silicon Valley Says Space Mining Is Awesome and Will Change Life on Earth. That’s Only Half Right. <https://newrepublic.com/article/117815/space-mining-will-not-solve-earths-conflict-over-natural-resources> 5-19)

The “getting there first” will not be simple, or cheap. Most of the asteroids in the solar system are in the asteroid belt between Mars and Jupiter. But the orbit paths of some near-Earth asteroids, or NEAs, bring them relatively close to our planet—that is, within around 30 million miles. Planetary Resources has developed what is essentially an outer-space drone: a small telescope-equipped spacecraft, around the size of a desktop computer, that will survey near-Earth asteroids. Once an asteroid is identified and determined to be valuable, the extraction could begin, though that introduces a new set of technical obstacles. Because of the difficulty and expense of getting heavy machinery from Earth into space, some have suggested using 3D printing technology to use materials found in space to create the necessary equipment. Then, some modified version of a terrestrial mining method, like drilling or magnetic separation, could be used for the mining itself. But these extraction processes have been developed for the pressure and gravity of Earth, and they would need to be overhauled to function in the low-gravity, vacuum environment of space.

If this part of the process sounds unclear, it’s because it is. To give an idea of the scale—in time and difficulty—of these kinds of operations, consider the government’s version of asteroid prospecting. In April, NASA greenlighted a mission in which a spacecraft called OSIRIS-REx will rendezvous with an asteroid called Bennu. OSIRIS-Rex is scheduled to launch in 2016, reach the asteroid in 2018, reconnoiter it for over a year, and then bring back samples for scientific study. The amount of asteroid that NASA plans to collect after all this time and trouble? Two ounces. A major premise of private space mining companies is that they will be able to work far faster and more economically than NASA, and will be willing to take on levels of risk beyond that of a government operation, but the scale and timeline of OSIRIS-REx shows how complex these operations will be, even for the swiftest companies.

#### Astroid mining is dead, no infrastructure, no investor support

Araxia 19 “How the asteroid-mining bubble burst A short history of the space industry’s failed (for now) gold rush” by Atossa Araxia Abrahamian, Jun 26, 2019, https://www.technologyreview.com/s/613758/asteroid-mining-bubble-burst-history/

In the best of worlds, Chris Lewicki and Peter Diamandis might have changed the course of human civilization. Their startup, Planetary Resources, was launched in 2012 with the modest dream of mining asteroids for minerals, metals, water, and other valuables. The founders’ résumés and connections gave the zany idea institutional legitimacy: Lewicki had worked on major NASA missions such as the Mars Spirit and Opportunity rovers, and Diamandis was a well-known space--tourism booster. Together with a third partner, Eric Anderson, Planetary Resources had raised $50 million by 2016, of which $21 million came from big-name investors including Google’s Eric Schmidt and filmmaker James Cameron. This story is part of our July/August 2019 issue Before long, a competitor called Deep Space Industries (DSI) appeared on the scene. It raised much less cash: just $3.5 million, supplemented by some government contracts. But it had its own high-profile backers, pie-in-the-sky goals, and a particularly evangelical board member named Rick Tumlinson, who made the rounds at conferences pitching the company’s vision. “Crazy ideas: that’s what moves culture forward,” he said at a 2017 event in New York. “Nothing says this is impossible except our own belief systems.” It was sci-fi come to life—and everybody loved it. “Space mining could become a real thing!” headlines squealed. Amazon CEO Jeff Bezos began speaking of a future in which all heavy industry took place not on Earth, but above it. NASA funded asteroid-mining research; the Colorado School of Mines offered an asteroid-mining degree program; Senator Ted Cruz predicted that Earth’s first trillionaire would be made in space. “There was a lot of excitement and tangible feeling around all of these things that we’ve been dreaming about,” says Chad Anderson (no relation to Eric), the CEO of Space Angels, a venture capital fund that invests in space-related companies. Sign up for The Airlock — your gateway to the future of space technology Also stay updated on MIT Technology Review initiatives and events?YesNo Also crucial to the money-making opportunities was the burgeoning commercial space sector’s lobbying, which shepherded the SPACE Act through Congress in 2015. This not--uncontroversial bill included a “finders, keepers” rule whereby private American companies would have all rights to the bounty they extracted from celestial bodies, no questions asked. (Before that, property rights and mining concessions in space, which belongs to no country, were not a given.) That, in turn, would make it possible to work toward a goal that Eric Anderson predicted could be reached by the mid-2020s: extracting ice from asteroids near Earth and selling it in space as a propellant for other missions. Water can be broken into hydrogen and oxygen to make combustible fuel, or—as in DSI’s technology—just heated up and expelled as a jet of steam. “Both companies believed one of the early products would be propellant itself—that is, water,” says Grant Bonin, the former chief technology officer of Deep Space Industries. “What DSI had been doing is developing propulsion systems to run on water. And everyone who buys one is creating an ecosystem of users now that can be fueled by resources of the future.” By the spring of 2017, Planetary Resources was operating a lab in a warehouse in Redmond, Washington, decorated with NASA paraphernalia and vintage pinball machines. Engineers tinkered with small cube satellites behind thick glass walls, crafting plans to launch prospecting machines. Luxembourg had given the company a multimillion-dollar grant to open a European office. Japan, Scotland, and the United Arab Emirates announced their own asteroid-mining laws or investments. The stars had burned through their red tape. The heavens were ready for Silicon Valley. Then things started going south. Last summer, Planetary failed to raise the money it was counting on. Key staffers, including Peter Marquez, the firm’s policy guy in Washington, had already jumped ship. “We were all frustrated about the revenue prospects, and the business model wasn’t working out the way we’d hoped,” recalls Marquez, who now works for a Washington, DC, advisory shop called Andart Global. “There was more of a focus on the religion of space than the business of space,” Marquez adds. “There’s the religious [segment] of space people who believe that almost like manifest destiny, we’re supposed to be exploring the solar system—and if we believe hard enough, it’ll happen. But the pragmatists were saying there’s no customer base for asteroid mining in the next 12 to 15 years.” A conceptual illustation of asteroids CHRISSIE ABBOT Amid rumors that it was auctioning off its gear, Planetary Resources was acquired last year by ConsenSys, a blockchain software company based in Brooklyn that develops decentralized platforms for signing documents, selling electricity, and managing real estate transactions, among other things. Anderson Tan, an early investor in Planetary Resources, was baffled by the acquisition—and he’s the kind of blockchain guy who promotes other blockchain guys’ blockchain ventures on LinkedIn. “I honestly have no idea … I was shocked. I think they wanted to acquire the equipment and assets,” he says. “For what? I’m not so sure.” DSI, in turn, was acquired by an aeronautics company named Bradford Space. These acquisitions aren’t taking the companies anywhere. “They’re gone; they’re done. They don’t exist,” says Chad Anderson. The lack-of-vision thing What went wrong? Predictably, ex--employees and investors tell slightly different stories. Bonin blames DSI’s demise on investors’ unwillingness to take long-term risks. “We had a plan that would take off after a certain point, and we didn’t get to that point,” he explains. “And we were only $10 million away from hitting that point, but our planning was decades long, and a VC fund’s life cycle is one decade long. They’re incompatible.” Meagan Crawford, who worked with Bonin and is now starting her own venture capital fund for commercial space startups, concurs: “A traditional VC time line is 10 years, when they have to give money back to investors, so in seven years they want to exit. A 15-year business plan isn’t going to fit in.” On the money side, the story is a little less forgiving. “They did not deliver on their promises to investors,” says Chad Anderson, whose Space Angels invested in PR. “Both companies were really good at storytelling and marketing and facilitating this momentum around a vision that their technology never really substantiated.” He adds, “I think that these weren’t the right teams to do it.” There were also bigger structural obstacles—such as, in former employees’ telling, the lack of any infrastructure for an asteroid--mining industry. That put investors off, too: “If you mine an asteroid, mostly likely you’ll [have to] send it to the moon to process it. It wouldn’t be processed on Earth, because the cost would be tremendous,” says Anderson Tan. “So then it’s like a chicken-and-egg problem: do we mine first and then develop a moon base, or invest in building up the moon and then go to asteroid mining?” On the money side, the story is a little less forgiving. Finally, asteroid miners had to compete for funding with a proliferating number of other space-related ventures. Between 2009—“the dawn of the entrepreneurial space age”—and today, “we’ve gone from a world with maybe a dozen privately funded space companies serving one client, the government, to one with more than 400 companies worth millions of bucks,” Chad Anderson says. So if commercial space startups seemed like an out-there proposition in 2012, by 2018 VCs who wanted space in their portfolios could have their pick of companies with better short-term prospects: telecom startups selling internet access, for instance, or firms analyzing the much-more-accessible moon. “The bottom line is that space is hard,” says Henry Hertzfeld, the director of the Space Policy Institute at George Washington University. (Hertzfeld advised Planetary Resources on legal matters; the space world, on Earth, is still very small.) “It’s risky, it’s expensive; lots of high up-front costs. And you need money. You can get just so much money for so long.” To succeed, says Hertzfeld, the companies would have needed to make a profit from other uses of their technology—such as DSI’s water propulsion system, which could be used in satellites, and PR’s hyperspectral sensors, which it built to analyze the composition of asteroids but can also be put to work surveying the Earth. “But they didn’t generate the revenues,” he says, “and there’s a limited amount of time for a company to exist without a profit.” According to Space Angels, $1.7 billion in equity capital poured into space companies in the first quarter of 2019, nearly twice as much as in the last quarter of last year. Of that, 79% went toward satellite businesses and 14% to logistical operations, like rocket launches. The fund’s own interests mirror these trends. “The commercial space industry is maturing to the point where it’s more serious now,” says Peter Ward, the author of The Consequential Frontier, a forthcoming book about the privatization of space. “Some of the people I talked to now see asteroid mining as a bit of a joke.” Building a new frontier In spite of these failures, former asteroid miners sound remarkably chipper about their prospects—and humanity’s interstellar future. Asteroid mining was a gateway drug for high hopes and big dreams. Tamara Alvarez, a doctoral student at the New School in New York who has attended space conferences around the world, says that the rhetoric around space mining maps perfectly onto older frontier tropes. “The mining thing resonated with a lot of people because of the gold rush narrative. There’s something unconscious there that they tapped into,” she says. Similarly, though neither asteroids nor 19th-century California actually created many overnight billionaires, they did create frameworks for how an economy based on a particular resource would function. “There wasn’t all the gold in California, but it brought an infrastructure that people made money off of,” says Alvarez. “Services, fishing—all this grew out of ambitions for gold. With asteroids, it’s the same thing: when you get the idea that there’s all the gold or whatever you need waiting for you, the infrastructure gets built too.” The asteroid miners seem to have thought of it that way. “I think when DSI and PR got started, the headlines all said asteroid-mining [companies] were like [traditional] mining companies,” says Grant Bonin. “But internally we’d joke: We’re not miners yet. We’re the pickax and shovel or Levi’s jeans of space. We’re the creators of tools that were brought into existence that would support the vision, but also help a lot of other people to do a lot more.” Equally significant is that the prospect of asteroid mining pushed governments to think about property rights in space. “The horizon for asteroid mining is still a couple of decades off, but I do think we’re going to do Mars missions, and we’ll need resources in space,” says Marquez. “And thanks to asteroid mining, the policy framework’s been established.”

## Solar Power DA

#### Technical barriers render SBSP implementation infeasible.

Jakhu & Pelton ’17 (Ram S & Joseph N; director of and tenured associate professor at the Institute of Air and Space Law, McGill University, Montreal, Canada, chair of the Management Board of the McGill Manual on International Law Applicable to Military Uses of Outer Space Project, coordinator of the International Study on Global Space Governance; former dean and chairman of the Board of Trustees of the International Space University, director emeritus of the Space and Advanced Communications Research Institute at The George Washington University; 2017; “Chapter 9: Space-Based Solar Power”; *Global Space Governance: An International Study;* Springer; pp. 206-207; TV)

SBSP is not free of difficulties. It still has many technical challenges ahead. The development of new and more cost-efficient implementation systems seems needed to transform SBSP from a concept to a functioning space service. Advocates of SBSP seem to believe that this will become possible in coming years, based on cur- rent research and promising developments. Nonetheless, beyond the development of new technologies, the SBSP industry will also give rise to regulatory, legal and safety standards issues, and concerns. Fortunately, this new satellite application, in making the transition from a concept to a new space service, will likely benefit from the precedents and best practices that derive from the rule-making activities for other established space applications. Undoubtedly, initial uses for large-scale power production in orbit will be space-based, as the economic activity in the near-Earth orbit (NEO) has a growing tendency. This initial practice and the “rules of the road” for the regulation of SBSP satellites will draw on the experience of the UNCOPUOS, the ITU, and perhaps the WMO plus and the International Committee on the Global Navigation Satellite Systems (ICG). To the extent that new processes for space transportation management and control evolve in time, this might as well involve useful regulatory inputs from the ICAO.

The issues that arise from SBSP could be numerous and involve potential areas of frequency interference or coordination with satellite communications, space navigation, and remote sensing. The potential areas of concern include: (i) frequency allocation, spectrum management, and potential interference with other services; (ii) use of designated orbits and necessary orbital management; (iii) space debris and debris management concerns; (iv) power transmission levels, radiation limits, and safety standards and concerns; (v) laser transmission controls and associated consideration of restrictions on space weapons; (vi) safety risks to life and property on Earth and in the air; (vii) sustainability of the space environment; and (viii) global political and financial interests related to the use of SBSP to provide clean renewable energy to address carbon dioxide (CO2) levels and climate change concerns. Appropriate solutions need to be found to answer these and other related issues before SBSP could become viable, both operationally and commercially.

#### No SBSP for 30 years.

Fan et al ‘11 – MAs from Caltech [\*William Fan, \*\*Harold Martin, \*\*\*James Wu, \*\*\*\*Brian Mok, “Space Based Solar Power: Industry and Technology Assessment”, 6/2/11; https://web.archive.org/web/20131115230217/http://www.pickar.caltech.edu/e103/Final%20Exams/Space%20Based%20Solar%20Power.pdf, AL]

While hard to estimate, we believe currently that SBSP is not feasible for the next 30 years. There must first be a large decrease in launch costs, and significant adoption of solar technology before SBSP would be a plausible large scale energy source. Efficiency levels are still not yet at a level where the large added cost of a space launch can justify SBSP. Furthermore, the difficulties in large scale wireless energy transmission is paramount, and have large scale demonstrations have not yet occurred over significant distances. We have also not yet seen a large boom in large scale wireless energy transmission that would allow us to project an efficiency trend for this technology. We conclude that it is still too early for SBSP, barring any large scale technological disruptions within the next 30 years.